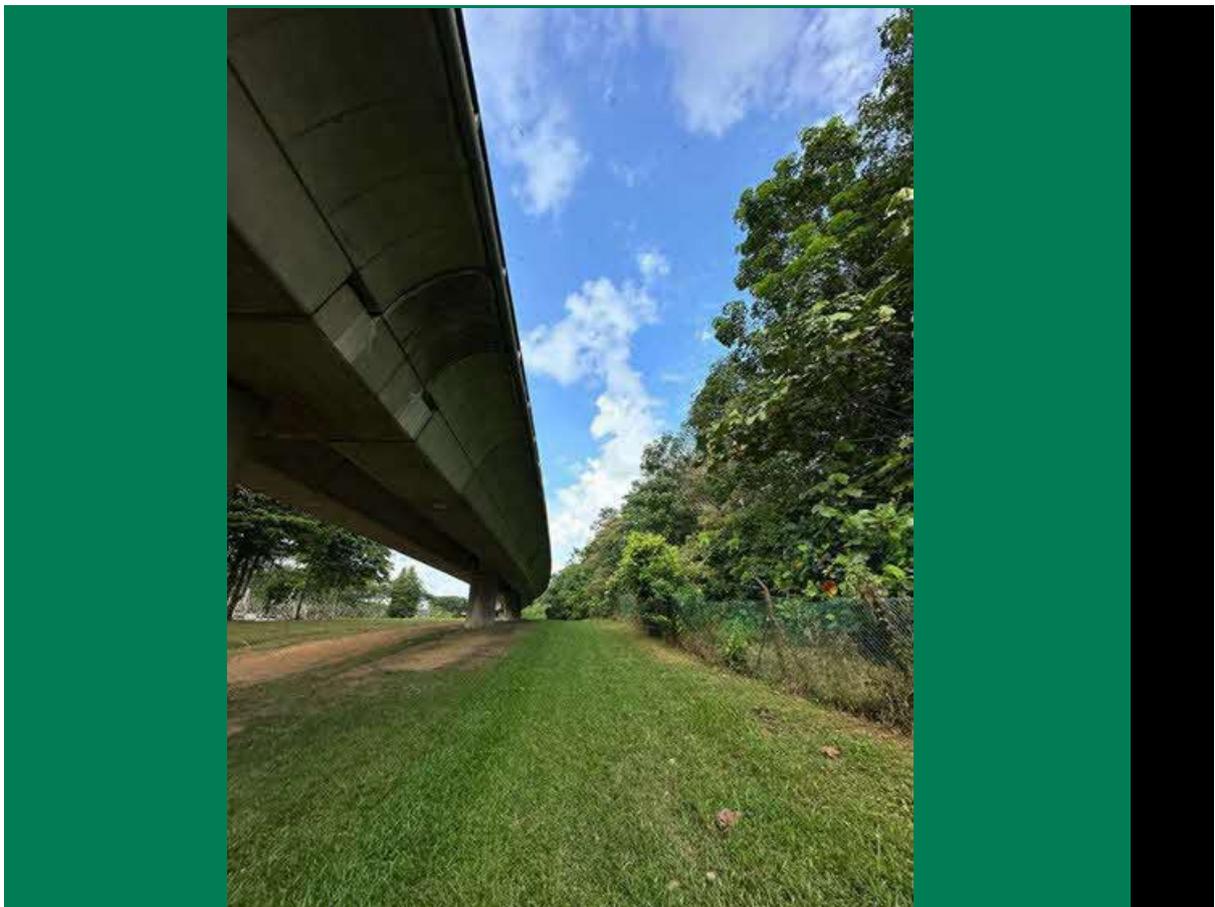


Specialist Consultancy Services for Environmental Impact Assessment (EIA) at Chencharu (Site 1)

National Parks Board
NParks/F/1/2024

Executive Summary



Introduction

The National Parks Board (NParks) has appointed Jacobs (under the contracting entity of CH2M Hill Singapore Pte Ltd) on behalf of the Housing & Development Board (HDB) on 29 July 2024 to conduct Specialist Consultancy Services for an Environmental Impact Assessment (EIA) at Yishun (“hereinafter referred as “the EIA Study”). This Report for Site 1 has been prepared as one of the deliverables of the EIA Study for the proposed upcoming public housing developments at Chencharu in Yishun (referred to as the “Project”).

The area of these proposed developments (hereinafter referred to as the “Subject Site”) spans an approximate area of thirty-three (33) hectares and is bounded by Sembawang Road, Yishun Avenue 1 / 2, Yishun Walk, and ongoing construction works for earlier phases of public housing developments in Chencharu (**Figure 1**). The Subject Site has been occupied by various brownfield uses since the late 1800s, including agricultural, commercial, and recreational uses. Currently, the Subject Site is occupied by ornamental fish farms, temporary worksites, and other recreational and research uses that have or are in the process of vacating (e.g. ORTO Leisure Park, SingHealth’s National Large Animal Research Facility, etc.). The land use within the Subject Site is zoned “Residential (Subject to Detailed Planning)” in URA’s gazetted Master Plan 2025 (**Figure 2**) and was announced in 2024 for housing developments as part of the new Chencharu housing area within Yishun Town, given its proximity to Khatib MRT and the existing town fabric of Yishun.

The EIA Study focuses on two separate, non-contiguous sites located within the Subject Site (**Figure 1**):

- Site 1 consists of a vegetated patch with an approximate area of seven (7) hectares along Yishun Avenue 1, which is being studied for residential development and supporting amenities as announced earlier. Site 1 will be the focus of this report.
- The EIA Study also contains a separate report for Site 2, an 18-meter-wide earth drain that ran from Sembawang Road to Yishun Avenue 2 and is planned to undergo diversion and improvement works to minimise flood risk. The Report for Site 2 was published on 15 January 2025 and opened for public feedback until 11 February 2025, and stakeholder feedback has been incorporated into the mitigation measures to ensure safeguards for water quality and aquatic fauna. The Report for Site 2 and the response to the stakeholder feedback received are available on HDB’s website for viewing.

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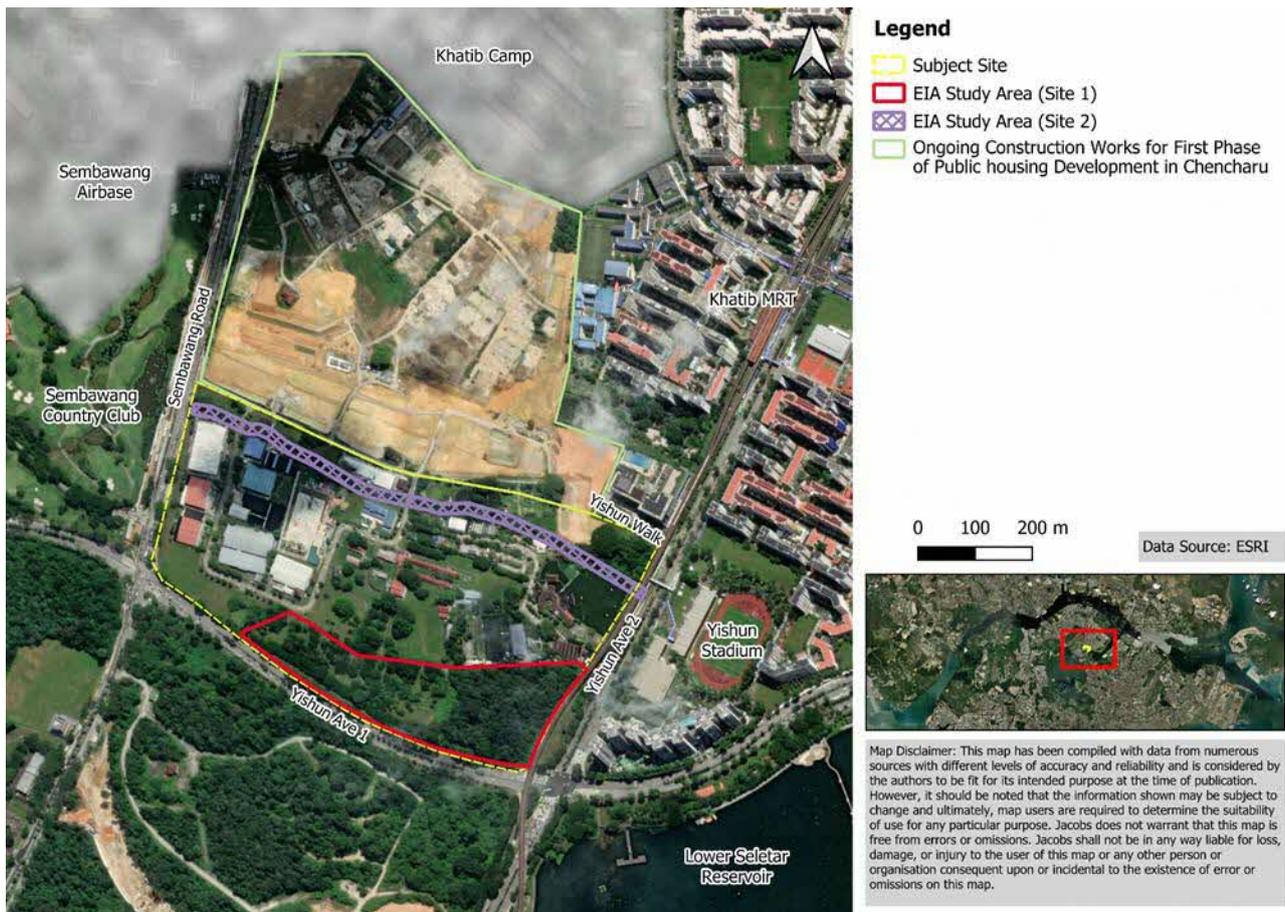


Figure 1: Overview of EIA Study Area for Site 1 and Subject Site Boundary

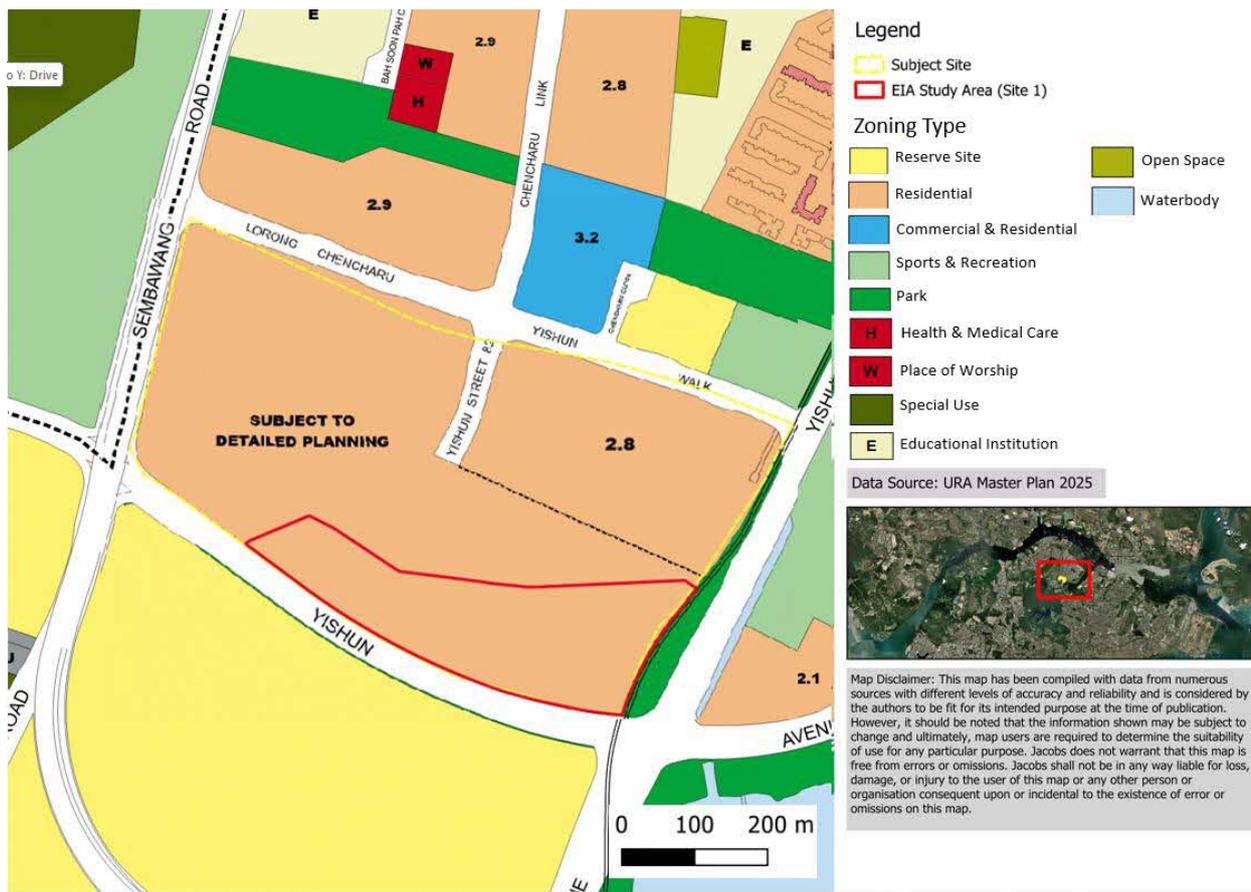


Figure 2: Land Use Intent

Project Description and Objectives

The 7-hectare vegetated patch at Site 1 was previously occupied by brownfield plantation uses such as gambier, pepper, pineapple and rubber throughout the 1900s. After the plantation uses were phased out, the site was largely abandoned to regrow, and the western portion of Site 1 is used by NParks as a tree bank for landscaping works. This patch is being studied for residential developments and accompanying amenities as part of the larger Chencharu housing area, as announced in 2024.

The EIA Study, as presented in the Report for Site 1, aims to:

- Identify and describe the existing environmental conditions for geomorphology, ecology and biodiversity at Site 1, and ambient noise at sensitive receptors in the vicinity of Site 1 that are likely to be affected by the Project and/or likely to cause impact to the Project,
- Identify, quantify, and assess the potential environmental impact and determine the significance of these impact areas on sensitive receptors in the vicinity of Site 1.
- Recommend and justify effective mitigation measures to minimise any identified environmental impact (e.g. pollution, environmental disturbance) during the construction and operational phases of the Project.
- Identify, predict, and evaluate the residual environmental impact after the implementation of proposed mitigation measures.

The Modified Rapid Impact Assessment Matrix (RIAM) will be used as the impact assessment methodology to assess the overall impact to the key environmental aspects from the development of this Project. RIAM is a semi-quantitative impact assessment method modified/ adopted from Pastakia (1998) and Ijas et al. (2009).

This modified RIAM approach applies a scoring matrix (quantitative indicators) for impact evaluation in the form of Environmental Scores (ES) which range from extreme positive impact to critically negative impact for each specific project activity with consideration of the sensitivity level of the existing baseline environmental conditions.

Environmental Baseline Results

Geomorphology

Soil: The geological profile at Site 1 shows silty sand with organic matter and decomposed vegetation up to 2 m below ground. From 2 to 11 m, various stiff silts and clays dominate, including completely decomposed granite. Coarse sand with rock fragments and granite appears between 13.5 to 19.5 m depth.

Groundwater: Historical Soil Investigation reports in the area have recorded groundwater at varying depths of 0.8 to 3.3 mbgs.

Geology: Most of Site 1 sits on the Simpang Granite Pluton, with the western tip sitting on the Dairy Farm granite and a southern portion sitting on the Kranji formation. The northern portion of the Subject Site lays on the Jalan Besar formation.

Topography: Site 1 exhibits a range in elevation from a low of 5.49 m to a high of 22.34 m, indicating a general slope across the site. The lowest point is located at the southeast corner of the EIA Study Area, while the highest elevation is situated at the northwest corner.

Ecology and Biodiversity

Habitats and Ecological Significance: Site 1 consists of three habitat types: (1) abandoned land forest (40%), (2) scrubland / grassland (35%), and (3) urban vegetation (25%). There were no waterbodies surveyed at Site 1. Overall, there were **no Areas of High Ecological Value (AHEV) identified within Site 1**. Of the surveyed habitat types, the scrubland / grassland and urban vegetation areas, which occupy 60% of the site collectively, were assessed to be of **low ecological value** as they do not support unique flora or fauna species and these habitat types are common in Singapore. The abandoned land forest area was assessed to be of **medium ecological value** as it serves as a potential refugia for native species and a potential stepping stone for volant fauna traversing between surrounding forested areas, which instead serve as wider connectivity pathways and habitats for wildlife themselves. Connectivity through Site 1 is limited for non-volant species as Site 1 is bounded by major roads and surrounding brownfield uses which constrain ground movement.

Flora: A total of 203 plant species and species groups belonging to 78 families were recorded within Site 1. Of the 203 species and species group recorded, 100 (49.3%) were native, 89 (43.8%) exotic, and 12 (5.9%) cryptogenic. One (0.5%) has not been assessed and one (0.5%) was of unknown origin as they could not be identified to species. Within Site 1, 27 native threatened species and species groups (13.3%) were recorded. Other findings include 14 large plant specimens and 8 specimens of value, such as a weeping fig tree (*Ficus benjamina*) and a variegated fig tree (*Ficus variegata*). No specimens with bird nests or bamboo clusters were recorded from the surveys.

Fauna: The field assessment recorded a total of 137 faunal species, comprising 21 aculeate hymenopterans, 49 birds, 34 butterflies, 15 herpetofauna, nine mammals, and nine odonates. Of the 137 faunal species recorded, five species of conservation significance were recorded, comprising one mammal (long-tailed macaque), and four birds; straw-headed bulbul (*Pycnonotus zeylanicus*), plume-toed swiftlet (*Collocalia affinis*), Swinhoe's white-eye (*Zosterops simplex*), and long-tailed parakeet (*Psittacula longicauda*). Roadkill surveys conducted along Yishun Ave 1 bordering the forest edge did not record any findings.

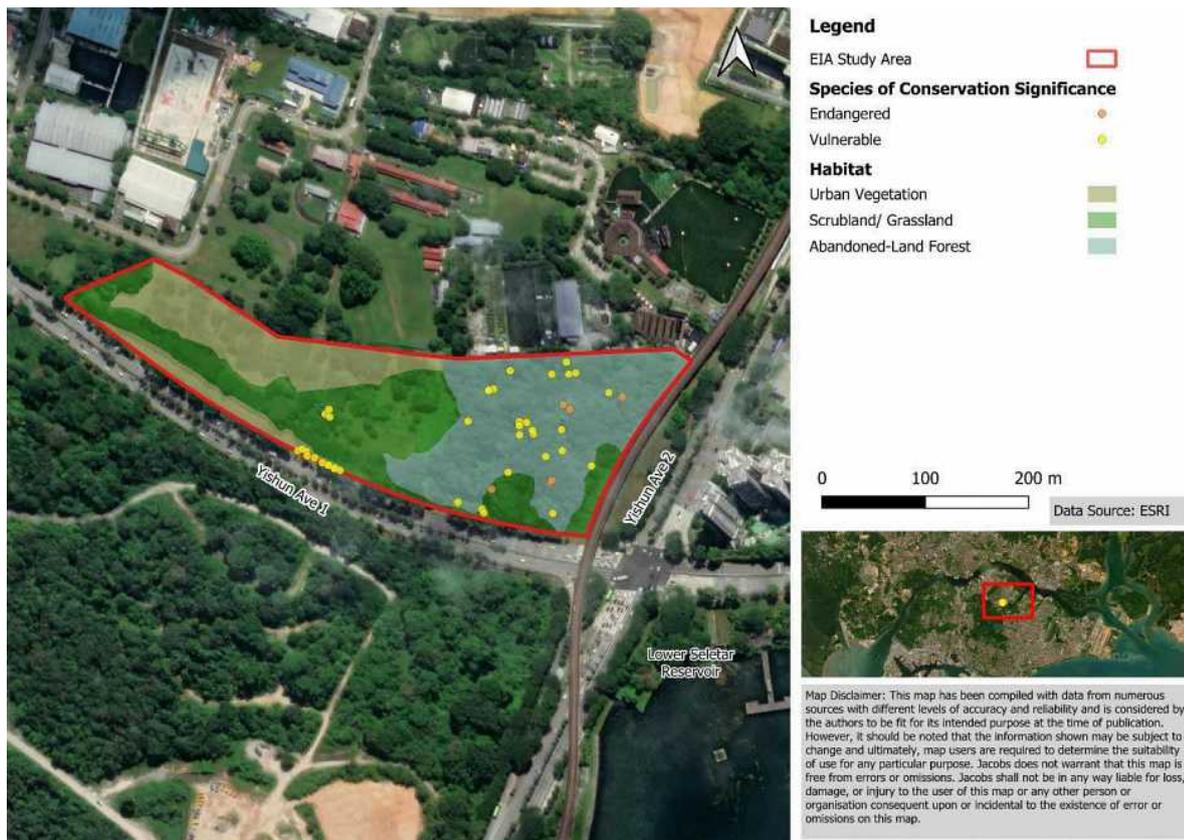


Figure 3: Location of Plant Species of Conservation Significance within Site 1

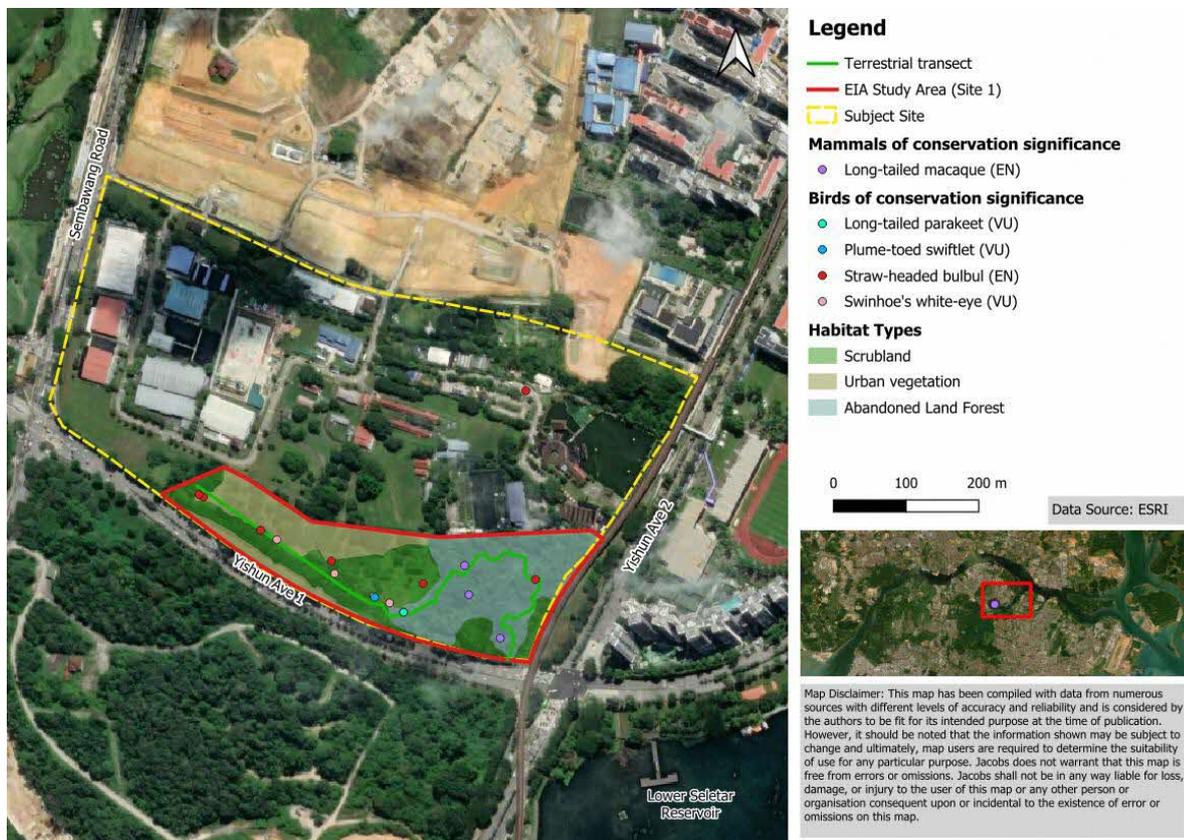


Figure 4: Location of Fauna Species of Conservation Significance within Site 1

Ambient Noise

Baseline ambient noise sampling was conducted at one location within the adjacent forested area south of Site 1 to measure ambient noise for ecological receptors (i.e. fauna). Results found that noise levels were generally higher during the day, evening, and night on weekdays as compared to Sunday and public holidays, corresponding to peak traffic periods. Possible contributors to the baseline ambient noise levels measured in the forested patch south of Site 1 include vehicular traffic along Yishun Avenue 1 and Lentor Avenue, adjacent MRT operations along the elevated North-South Line MRT track, and fauna within the forested area itself. It is reasonable to assume that certain species have likely developed coping mechanisms to existing noise sources and adapted to current baseline ambient noise levels.

Minimum Control Measures

Table 1 shows the minimum controls commonly implemented in Singapore for proposed development activities in vegetated areas.

Table 1: Description of Minimum Control Measures Implemented at Construction Phase

Impact	Minimum Controls Adhered to Applicable Regulations and Code of Practices
Sedimentation / Soil Erosion	
Sedimentation/ Soil Erosion	<ul style="list-style-type: none"> ▪ Before work commences, submit a detailed Earth Control Measure (ECM) proposal duly endorsed by a Qualified Erosion Control Professional (QECP) to PUB and copied to HDB indicating: <ul style="list-style-type: none"> - Plans to minimise exposed surfaces. - Implementation of effective sediment control facilities (including storage and treatment facilities). - ECM systems that will be put in place prior to the commencement of physical works. - A Clearance Certificate that is obtained prior to the commencement of physical works. - Revisions or updates to the ECM systems during construction to control silty discharge, where necessary. - ECM shall not be removed prior to the completion of physical works. Relevant approvals from PUB shall be obtained for removal of ECM upon the completion of physical works. - Condition of ECM shall be inspected regularly and during/after every rain event. - QECP shall carry out regular audit/reviews for every stage of the construction works and revise the ECM on-site accordingly. ▪ Earth surfaces or slopes adjacent to any drain shall be close turfed, paved or covered with appropriate materials. ▪ Bare surfaces shall be covered up with appropriate materials before rain and daily works should be halted to reduce the volume of silty water to be contained and treated. ▪ The treatment of silty water shall be closely monitored, and the treatment shall be halted immediately if silty water is being discharged to public drains.

Impact		Minimum Controls Adhered to Applicable Regulations and Code of Practices	
Biodiversity			
General		<ul style="list-style-type: none"> ▪ Install hoarding to delineate the worksite. ▪ Avoid fogging by implementing preventive measures for mosquito breeding to remove sources of stagnant water or water-bearing receptacles, e.g. clear discarded items daily, store materials appropriately, level up ground depression/uneven surfaces, ensure effective drainage flow. ▪ Visual checks by an ecologist for animal entrapments on-site during backfilling works, ECBs and among construction materials and equipment ▪ Visual checks for gaps in hoarding. ▪ Execute a wildlife response plan when a trapped/ injured/ dead/ dangerous animal is encountered around or within the worksite according to Appendix 1A, Section 10 of Wildlife Act. 	
Vegetation Clearance		<ul style="list-style-type: none"> • Directional site clearance to shepherd fauna to an area allowing them to leave by themselves or through rescue and relocation if needed. It is recommended that the hoardings along the roads should be properly constructed before any directional site clearance commences. • Conduct inspections of fauna prior to felling or removal of vegetation. This should be done by an ecologist who is able to identify wildlife and/or active nesting structures, such as bird nests, tree hollows and/or burrows, and bamboo clusters. • Implement soil erosion control measures as soon as vegetation has been removed and soil is exposed (refer to Section 4.5.1). ▪ Engage a Qualified Erosion Control Professional (QECP) to formulate and implement an ECM plan in accordance with PUB requirements. 	
Ambient Noise			
General		<ul style="list-style-type: none"> ▪ Noise Barriers: <ul style="list-style-type: none"> - Erection of Sound Transmission Class (STC) 20 noise barrier along the Project's eastern, southern, and western boundaries. ▪ Engineering Controls: <ul style="list-style-type: none"> - Use of quieter construction methods wherever possible. - Place stationary Powered Mechanical Equipment (PME) inside enclosures. - Apply noise screens/panels for shielding noisy mobile PME where applicable. ▪ Noise Management Plan (NMP): <ul style="list-style-type: none"> - Noise Management Plan is to be prepared by the contractor, incorporating finalised construction methods, schedules, and equipment sound power levels. ▪ Construction Planning: <ul style="list-style-type: none"> - Construction works are to be planned to minimise on-site noise sources through the optimisation of construction sequences and methods. - Heavy construction activities are to be limited to 8 a.m. – 6 p.m., where possible. 	

Impact	Minimum Controls Adhered to Applicable Regulations and Code of Practices
	<ul style="list-style-type: none">- Loud construction activities are to be started progressively to allow mobile fauna to vacate the area before noise levels intensify.▪ Operational Best Practices:<ul style="list-style-type: none">- Only well-maintained PME is to be operated on-site.- Minimise the number of PME near fauna-sensitive areas wherever possible and shut down or throttle down PMEs when not in use.▪ Directional noise sources are to be oriented away from fauna-sensitive areas.

Summary of Impact Assessment, Key Mitigation Measures Proposed and Evaluation of Post-Mitigation Residual Impact

The implementation of (i) requirements or standard practices of minimum controls commonly applied in Singapore for similar activities presented in **Table 1** above and the (ii) additional recommended mitigation measures proposed below are expected to **reduce the magnitude and permanence of the anticipated environmental impact of the proposed development** and guide sensitive planning / construction works (**Table 2, Table 3, and Table 4**).

Table 2: Summary of Impact and Evaluation of Residual Impact for Geomorphology, Habitats, and Noise

Impact Register	Before Mitigation Measures		Post Mitigation Measures (Residual Impact Significance)	
	Environmental Score (ES)	Range Band of ES / Impact Significance	Environmental Score (ES)	Range Band of ES / Impact Significance
Construction Phase				
Geomorphology				
Soil infiltration capacity	-20	Minor Negative Impact	-10	Slight Negative Impact
Soil loss	-60	Minor Negative Impact	-10 to -20	Slight negative Impact to Minor Negative
<p>Key recommended mitigation measures for Geomorphology:</p> <ul style="list-style-type: none"> • Implement the site clearance and earthworks in stages. • Engagement of a Qualified Person (QP) to conduct slope stability and soil compaction studies. • Engagement of a certified Qualified Erosion Control Professional (QECP) to design an Earth Control Measure (ECM) plan for Site 1 prior to construction commencement. • Adopt the ECM plan and ECM best practices on-site at all times. <p>These mitigation measures are expected to minimise the impact to soil infiltration capacity and soil loss as much as possible, reducing the impact to Slight Negative / Minor Negative. The full list of recommended mitigation measures for geomorphology is presented in Section 4.5 of the Report for Site 1.</p>				
Habitats				
Loss of habitat (Abandoned land forest)	-234	Moderate Negative Impact	-234	Moderate Negative Impact
Loss of habitat (Scrubland/ Grassland)	-117	Minor Negative impact	-117	Minor Negative impact
Loss of habitat (Urban vegetation)	-117	Minor Negative impact	-117	Minor Negative impact

Specialist Consultancy Services for Environmental Impact Assessment (EIA) at Chencharu (Site 1)

Impact Register	Before Mitigation Measures		Post Mitigation Measures (Residual Impact Significance)	
	Environmental Score (ES)	Range Band of ES / Impact Significance	Environmental Score (ES)	Range Band of ES / Impact Significance
Noise (L_{Aeq} 12 hours) – Infrastructure Works				
Noise emission from construction site to sound sensitive ground-dwelling fauna of conservation significance	-180	Moderate Negative	-60	Slight Negative
Noise emission from construction site to sound sensitive arboreal fauna of conservation significance	-180	Moderate Negative	-180	Moderate Negative
Noise emission from construction site to sound sensitive ground-dwelling fauna of non-conservation significance	-120	Minor Negative	-40 to -80	Slight Negative to Minor Negative
Noise emission from construction site to sound sensitive arboreal fauna of non-conservation significance	-120	Minor Negative	-120	Minor Negative
Noise (L_{Aeq} 5 mins) – Infrastructure Works				
Noise emission from construction site to sound sensitive ground-dwelling fauna of conservation significance	-180	Moderate Negative	-60	Slight Negative
Noise emission from construction site to sound sensitive arboreal fauna of conservation significance	-180	Moderate Negative	-120	Minor Negative
Noise emission from construction site to sound sensitive ground-dwelling fauna of non-conservation significance	-120	Minor Negative	-40	Slight Negative
Noise emission from construction site to sound sensitive arboreal fauna of non-conservation significance	-120	Minor Negative	-80 to -120	Minor Negative

Specialist Consultancy Services for Environmental Impact Assessment (EIA) at Chencharu (Site 1)

Impact Register	Before Mitigation Measures		Post Mitigation Measures (Residual Impact Significance)	
	Environmental Score (ES)	Range Band of ES / Impact Significance	Environmental Score (ES)	Range Band of ES / Impact Significance
Noise (L_{Aeq} 12 hours) – BTO Works				
Noise emission from construction site to sound sensitive ground-dwelling fauna of conservation significance	-198	Moderate Negative	-66	Minor Negative
Noise emission from construction site to sound sensitive arboreal fauna of conservation significance	-198	Moderate Negative	-198	Moderate Negative
Noise emission from construction site to sound sensitive ground-dwelling fauna of non-conservation significance	-132	Moderate Negative	-44 to -88	Slight Negative to Minor Negative
Noise emission from construction site to sound sensitive arboreal fauna of non-conservation significance	-132	Moderate Negative	-132	Moderate Negative
L_{Aeq} 5 mins – BTO Works				
Noise emission from construction site to sound sensitive ground-dwelling fauna of conservation significance	-198	Moderate Negative	-66	Minor Negative
Noise emission from construction site to sound sensitive arboreal fauna of conservation significance	-198	Moderate Negative	-132	Moderate Negative
Noise emission from construction site to sound sensitive ground-dwelling fauna of non-conservation significance	-132	Moderate Negative	-44	Slight Negative
Noise emission from construction site to sound sensitive arboreal fauna of non-conservation significance	-132	Moderate Negative	-88 to -132	Minor Negative to Moderate Negative

Impact Register	Before Mitigation Measures		Post Mitigation Measures (Residual Impact Significance)	
	Environmental Score (ES)	Range Band of ES / Impact Significance	Environmental Score (ES)	Range Band of ES / Impact Significance
Impacts				
<p>Key recommended mitigation measures for Noise:</p> <ul style="list-style-type: none"> Control measures at emission source: <ul style="list-style-type: none"> Enclosures around PMEs with sufficient height and width to shield noisy parts Noise screens/ noise panels Portable noise barriers Quieter construction methodology Noise barriers <p>The implementation of these mitigation measures can potentially reduce noise levels by up to 27.4 dBA for ground-dwelling fauna and 14.9 dBA for arboreal fauna, thereby decreasing the anticipated ecological impact on faunal receptors. While the position of the noise barriers would mostly benefit ground-dwelling fauna, arboreal fauna are also likely to be more mobile than other fauna types, enabling them to relocate away from the noise source during construction. The full list of recommended mitigation measures for noise is presented in Section 6.4 of the Report for Site 1.</p>				

Table 3: Summary of Impact and Evaluation of Residual Impact for Flora and Fauna Receptors During Construction Phase (numbers denote number of receptors affected)

Construction Phase Impact				
Flora				
Impact Type	No Change	Minor Negative	Moderate Negative	Major Negative
Mortality	0	3	0	14
Fauna				
Impact Type	No Change	Minor Negative	Moderate Negative	Major Negative
Loss of/ reduction in habitats and food sources	0	7	0	34
Accidental injury or mortality	0	37	4	0
Human-wildlife conflict	34	2	5	0
Loss/reduction of ecological connectivity for fauna movement	11	14	16	0
<p>Key recommended mitigation measures for Flora and Fauna:</p> <p>Avoidance (see Section 5.5.6.1.1):</p> <ul style="list-style-type: none"> Retain key flora specimens of conservation value, including two keystone <i>Ficus</i> specimens (<i>Ficus benjamina</i> and <i>Ficus microcarpa</i>) that provide food sources for frugivores, subject to further feasibility studies and arborist assessments 				

Minimise (see Section 5.5.6.1.2 and 5.5.6.2):

- **Flora:** Salvage saplings of species of conservation significance
- **Fauna:**
 - **Construction Design:** Implement road calming measures, adaptive light controls at night
 - **Wildlife Management Plan:** Minimise accidental injury or mortality of fauna
 - **Shepherding:** Directional site clearance to shepherd fauna to an area allowing them to leave by themselves or through rescue and relocation if needed.
 - **Wildlife Response Plan:** Develop a Wildlife Response Plan in consultation with NParks' Animal Response Centre, for encounters with any trapped, injured or dead wildlife, as well as incidents of human-wildlife conflict within the development, to minimise animal injury and mortality. All site members should be briefed on the Wildlife Response Plan to ensure awareness and compliance.
 - **Biodiversity Awareness Training:** Minimise human-wildlife conflict with proper waste and food management. NParks should be notified if any wildlife is spotted and an approved contractor should be engaged to trap and remove it.

Compensatory (see Section 5.5.6.1.3):

- **Design a linear green strip of minimally 5m in width along the southern edge of Site 1**, adopting a curated enhanced planting palette that consists of native flora species that can increase vegetation structural complexity and attract native volant fauna such as bees, butterflies, and birds.
- **Enhancement multi-tiered planting at the southeastern corner of the future precinct to increase vegetation structural complexity by incorporating different layers and forms of vegetation (including ground cover, shrubs, trees, and epiphytes).** This will complement ecological connectivity of the larger forested areas in the area for native urban-tolerant volant fauna.
- **Design a native planting palette** to be implemented within the future development (see **Appendix 5L**)

Collectively, these mitigation measures can **reduce the anticipated environmental impact**, particularly in reducing the risk of plant mortality via retention and salvaging efforts, the risk of accidental injury and human-wildlife conflict of fauna via a coordinated wildlife response plan, and to maintain ecological connectivity for volant urban-tolerant species via retaining keystone *Ficus* species and compensatory planting strategies.

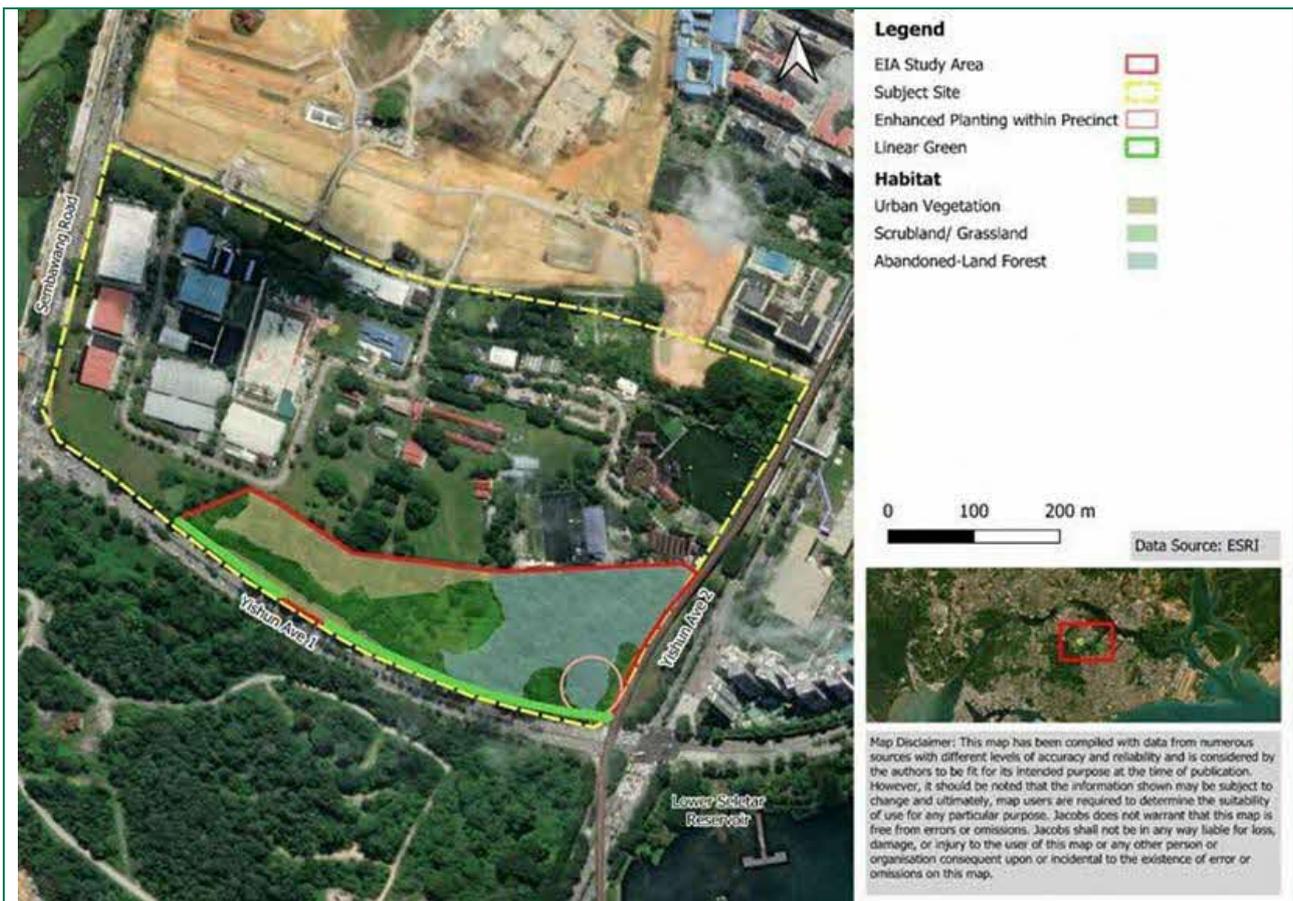


Figure 5: Proposed Linear Green Strip and Enhanced Multi-tiered Planting within Precinct as part of the Mitigation Measures for Site 1

Construction Phase Residual Impact				
Flora				
Impact Type	No Change	Minor Negative	Moderate Negative	Major Negative
Mortality*	3	1	1	1
Fauna				
Impact Type	No Change	Minor Negative	Moderate Negative	Major Negative
Loss of/ reduction in habitats and food sources	0	7	0	34
Accidental injury or mortality	0	41	0	0
Human-wildlife conflict	34	7	0	0
Loss/reduction of ecological connectivity for fauna movement	11	14	16	0

* 10 plant species were assessed as N/A impact due to proposed salvaging of saplings

Table 4: Summary of Impact and Evaluation of Residual Impact for Flora and Fauna Receptors During Operational Phase (numbers denote number of receptors affected)

Operational Phase Impact				
Fauna				
Impact Type	No Change	Minor Negative	Moderate Negative	Major Negative
Accidental injury or mortality	0	36	5	0
Human-wildlife conflict	32	3	5	1
Loss/reduction of ecological connectivity for fauna movement	11	14	16	0
<p>Key recommended mitigation measures:</p> <p>Most of the strategies for enhancement should have been considered during the design phase as elaborated in Table 1 above. The remaining key recommended measures to minimise impact during the operational phase include:</p> <ul style="list-style-type: none"> • Road calming measures to reduce the likelihood of roadkill • Educational signboards to educate the public on how to deal with wildlife encounters • Trash management measures such as wildlife-proof bins to minimise human-wildlife conflict <p>Implementing these measures can help to reduce the anticipated impact significance of various impact types. The full list of recommended mitigation measures for ecology and biodiversity is presented in Section 5.5.6.2 of the Report for Site 1.</p>				
Operational Phase Residual Impact				
Fauna				
Impact Type	No Change	Minor Negative	Moderate Negative	Major Negative
Accidental injury or mortality	0	41	0	0
Human-wildlife conflict	32	9	0	0
Loss/reduction of ecological connectivity for fauna movement	11	15	15	0